



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/082,264	05/20/1998	JIASHU CHEN	CHEN-1-(5442	2496

7590 09/16/2003

WILLIAM H. BOLLMAN
MANELLI DENISON & SELTER
2000 M STREET N.W.
WASHINGTON, DC 20036-3307

EXAMINER

GRIER, LAURA A

ART UNIT	PAPER NUMBER
----------	--------------

2644

DATE MAILED: 09/16/2003

24

Please find below and/or attached an Office communication concerning this application or proceeding.

7

Office Action Summary

Application No.

09/082,264

Applicant(s)

CHEN, JIASHU

Examiner

Laura A Grier

Art Unit

2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21, 23, 25 and 27-77 is/are pending in the application.
- 4a) Of the above claim(s) 27-77 is/are withdrawn from consideration.
- 5) ☐ Claim(s) 8 is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-14, 16, and 18- 21, 23, 25 is/are rejected.
- 7) ☐ Claim(s) 15 and 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 2644

DETAILED ACTION

1. The allowability of claims 16-20, 22 and 25 has been withdrawn in respect the Office Action below.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 1-7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. in view of Nagmitsu.

Regarding **claim 1**, Chen et al. discloses methods and apparatus for producing directional sound. Chen et al.'s disclosure comprises means of determining a characteristic function, wherein the characteristic constitutes a head-related impulse response, means of applying the characteristic function as a filter, and means of converting the filtered signal to a sound wave thus providing/producing the sound wave to a listener (figure 5b, col. 6, lines 45-67 - col. 7, lines 1-5 and col. 8, lines 1-25), and as well, Chen disclose the use of a discrete number samples to be used and eigenvalues (col. 4, lines 8-57). However, Chen et al. fails to specifically disclose the sound originating at a plurality of positions in space was well known in the art.

Regarding the sound originating at a plurality of positions in space, in a similar field of endeavor, Nagamitsu et al. (hereafter, Nagmitsu) discloses a sound environment simulator using a computer simulation and a method of analyzing a sound space. Nagmitsu teaches sound originating for a plurality

Art Unit: 2644

of positions in space as well in relation to spatial characteristics at a sound receiving point R (col. 6, lines 39-42 and figures 5-6 and 13-14).

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Chen et al. by incorporating means wherein the sound originates at a plurality of positions in space for the purpose of enhance and/or improving real-time stereophonic virtual audio and designing efficiency by limiting computation as taught by Nagamitsu.

Regarding **claim 2**, Chen et al. and Nagamitsu (hereafter, Chen) disclose everything claimed as applied above (see claim 1). Chen et al.'s disclosure further support for the characteristic function comprising data information related to the environment in which the sound is perceived (col. 3, lines 63-64).

Regarding **claims 3-7**, Chen discloses everything claimed as applied above (see claim 1). Chen et al.'s disclosure further inherently provides support of a spatial feature extraction and regularization model; spatial component and temporal component (summed matrix of a predetermined number of eigen vectors ranging from 3 to 16); and wherein the components are determined by a Karhunen-Loeve Expansion (col.4, lines 24-67 - col. 5, lines 1-53).

4. Claims 9, 13, 21 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Begault in view of Kendall et al., U. S. Patent No. 4731848.

Regarding **claim 9**, Begault discloses a multichannel spatialization system for audio signals. Begault's disclosure comprises a system with audio inputs for receiving a signal based upon a plurality of positions in space (figure 1), the input generates to a left and right channel signal in a digital filter wherein the filter includes the use a linear head related transfer function including a linear phase finite impulse response filter for providing spatial cues (col. 4, lines 62-67 and col. 5, lines 1-5); and provides a pair of headphones and/or electroacoustical transducers coupled to an amplifier for converting and producing a

Art Unit: 2644

sound to the for the listener (col. 4, lines 46-50). However, Begault fails to specifically disclose an input as claimed. The examiner maintains that such an input was well known in the art.

Regarding the input, in a similar field of endeavor, Kendall et al. (herein, Kendall) discloses a spatial reverberator. Kendall's disclosure teaches a continuum of sound source locations including direct signals from the location of the sources, and indirect reverberant signal reflected fro the surrounding environment, wherein the sounds are provided for multi-channel recording and reproducing, (col. 1, lines 9-12), which indicates an input for receiving a signal representing sound originating at a plurality of positions in space, including multiple reflections, multiple sound sources, with or without reflections.

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Begault by providing an input of varied sound sources with or without reflections for the purpose of enhancing the acoustic sound effects of multi-dimensional or virtual characteristic for the distribution of reflected sound to a listener.

Regarding **claim 13**, Begault and Kendall disclose everything claimed as applied above (see claim 9). Begault discloses the angle and elevation of the sound sources (col. 4, lines 24-28). Begault inherently discloses means constituting a calculator with a computer program, as evident by the function of the digital filters (col. 4, lines 61-68 and col. 5, lines 1-26).

Regarding **claims 21, 23, and 25**, Begault discloses a multichannel spatialization system for audio signals (figure 1). Begault's disclosure comprises delaying a sound source signal in a digital filter (16₁-16₄), col. 4, lines 61-68 and col. 5, lines 1-26; attenuation and filter of an input signal takes place in a low pass filter (12₁-12₄), col. 4, lines 7-10; further the digital filter provides more filtering and weighting of the filter sound signals (col. 6, lines 51-68, col. 7, lines 1-13, 42-53 and figure 2); and a summing network for summing the filtered sounds, wherein the filtered attenuated sound signal remains constant with a delayed signal, wherein the signals are adaptable to change position perspective in respect to the

Art Unit: 2644

listener (col. 10, lines 48-68 and col. 11, lines 01-12). However, Begault fails to specifically disclose the sound reflections as claimed. The examiner maintains that such reflections were well known in the art.

Regarding the input, in a similar field of endeavor, Kendall et al. (herein, Kendall) discloses a spatial reverberator. Kendall's disclosure teaches a continuum of sound source locations including direct signals from the location of the sources, and indirect reverberant signal reflected from the surrounding environment, wherein the sounds are provided for multi-channel recording and reproducing, (col. 1, lines 9-12), which indicates a plurality of positions in space, including multiple reflections, multiple sound sources, with or without reflections.

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Begault by providing varied sound sources with or without reflections for the purpose of enhancing the acoustic sound effects of multi-dimensional or virtual characteristic for the distribution of reflected sound to a listener.

5. **Claims 10-12** are rejected under 35 U.S.C. 103(a) as being obvious over Begault and Kendall in view of Chen.

Regarding **claim 10-12**, Begault and Kendall disclose everything claimed as applied above (see claim 1). However, Begault fails to specifically disclose a spatial feature extraction and regularization model, wherein the spatial feature extraction and regularization model comprises a spatial component and temporal component, with the temporal component including a matrix of a predetermined number of eigen vectors having a range of 3 to 16, and the spatial and temporal components are derived with a Karhunen-Loeve Expansion. The examiner maintains that such characteristic functions, thereof, were well known in the art.

Regarding the characteristic functions, Chen methods and apparatus for producing directional sound. Chen's disclosure provides support of a spatial feature extraction and regularization model; spatial

Art Unit: 2644

component and temporal component (summed matrix of a predetermined number of eigen vectors ranging from 3 to 16); wherein the components are determined by a Karhunen-Loeve Expansion (col.4, lines 24-67 - col. 5, lines 1-53).

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Begault and Kendall by implementing such characteristic functions and features for the purpose of optimizing the structure and performance of the device for improving binaural hearing of three-dimensional and/or virtual sound.

6. **Claim 14** is rejected under 35 U.S.C. 103(a) as being obvious over Begault and Kendall in view of Chen.

Regarding **claim 14**, Begault and Kendall disclose everything claimed as applied above (see claim 13). However, Begault fails to specifically disclose eigen filters and a plurality of source placement arrays. The examiner maintains that eigen filter and placement arrays were well known in the art.

Regarding the eigen filter, Chen methods and apparatus for producing directional sound. Chen's disclosure comprises eigen filters and placement arrays (col. 4, lines 8-21, col. 6, lines 20-44, and col. 7, lines 6-21 and figure 5a).

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Begault and Kendall by implementing an array eigen filters for the purpose providing optimal and sufficient time delay of the signal to the respective ear channels, further Chen discloses the filtering components may be used in the time domain method using inverse Fourier Transformation that yields impulse responses of basic filters (in which Begault teaches for his filters).

7. **Claims 16 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Kendall.

Art Unit: 2644

Regarding **claim 16**, Chen et al. discloses methods and apparatus for producing directional sound. Chen et al.'s disclosure comprises an environment input for receiving information of regarding the listening of the listener; means constituting a calculator with a computer program (col. 5, lines 58-65 and col. 7, lines 6-50); input for receiving a signal representing a sound; and left and right channel with a filter array for applying a filter to the signal, in which the function of the filter comprises a head-related impulse response; and an output for converting the filtered signals to the binaural sound and producing a sound to the listener (figure 5a and col. 6, lines 20-44 and col. 13, lines 2459) . Further Chen's disclosure comprises eigen filters and placement arrays (col. 4e, lines 8-21, col. 6, lines 20-44, and col. 7, lines 6-21 and figure 5a). However, Chen et al. fails to specifically disclose the sound originating at a plurality of positions in space was well known in the art.

Regarding the input, in a similar field of endeavor, Kendall discloses a spatial reverberator. Kendall's disclosure teaches a continuum of sound source locations including direct signals from the location of the sources, and indirect reverberant signal reflected fro the surrounding environment, wherein the sounds are provided for multi-channel recording and reproducing, (col. 1, lines 9-12), which indicates a plurality of positions in space.

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Chen by providing varied sound sources for the purpose of enhancing the acoustic sound effects of multi-dimensional or virtual characteristic for the distribution sound to a listener.

Regarding **claim 18**, Chen's disclosure comprises eigen filters (col. 4e, lines 8-21, col. 6, lines 20-44, and col. 7, lines 6-21 and figure 5a).

8. **Claim 20** is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen and Kendall and further in view of Sekine et al.

Art Unit: 2644

Regarding **claim 20**, Chen et al. and Kenadll disclose everything claimed as applied above (see claim 16). However, Chen fails to specifically disclose a cross-talk canceller. The examiner maintains that a cross-talk canceller was well known in the art.

Regarding a cross-talk canceller, in a similar field of endeavor, Sekine et al. discloses a sound-image position control apparatus. Sekine et al.'s apparatus comprises a cross talk canceller. (Col. 5, 2nd paragraph).

It would have been obvious to one of the ordinary skill in the art at the time the invention was made to modify the invention of Chen and Kendall by implementing a cross talk canceller prior to reproduction to speakers for the purpose of canceling/eliminating the cross-talk sounds which emerge when a person hears with both ears as taught by Sekine et al.

Allowable Subject Matter

9. **Claim 8 is allowed.**

10. Claims 15 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

11. Applicant's arguments with respect to claims 1-20, 21, 23, and 25 have been considered but are moot in view of the new ground(s) of rejection.

The applicant essentially argues that the prior art fails to teach the use of eigen values for determining the characteristic of a head related impulse response (claims 1-7). The examiner agrees that the prior art of Begault does not teach the use of eigen values. The prior art of Chen has been provided as adequate support of the claimed limitation. In respect to the prior art not disclosing filtering based on a

Art Unit: 2644

head-related impulse response, Chen discloses that the input signal is filtered based upon a FETF (constituting a type of head impulse response) and Begault teaches digital filter wherein the filter includes the use a linear head related transfer function including a linear phase finite impulse response filter for providing spatial cues (col. 4, lines 62-67 and col. 5, lines 1-5). And yet, in respect to the applicant's argument in respect to the difference of the prior art used and the invention, regarding the eigen filters and frequency (page 12 of Applicant's remarks), the claim language fails to reflect such specifics, and further distance can be related to a factor of time. Thus the primary references of Begault and Chen are still maintain as provided in the Office Action above with some modification/changes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laura A Grier whose telephone number is (703) 306-4819. The examiner can normally be reached on Monday - Friday, 7:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on (703) 305-4386.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Application/Control Number: 09/082,264

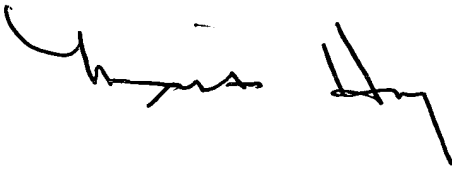
Page 10

Art Unit: 2644

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

LAG

September 8, 2003



MINSUN OH HARVEY
PRIMARY EXAMINER